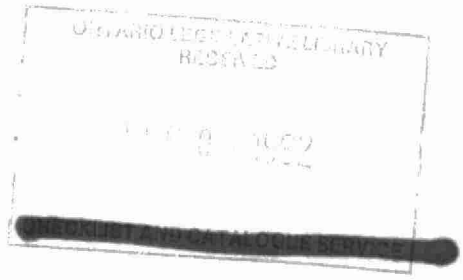
REPORT ON A PCB SPILL ON OCTOBER 8, 1980 AT ISABELLA STREET SCHOOL THUNDER BAY, ONTARIO



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NORTHWESTERN REGION
ONTARIO MINISTRY OF THE ENVIRONMENT
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SUMMARY

On October 8, 1980, a transformer at a Thunder Bay public school failed and ruptured, causing a loss of insulating fluid containing high levels of PCB (polychlorinated biphenyl) compounds.

During the period after the spill, and continuing until all contaminated material had been removed, the Ontario Ministry of the Environment advised Thunder Bay Hydro on clean-up procedures, conducted environmental monitoring, and participated in a public meeting to inform concerned parents.

Only in the immediate vicinity of the ruptured transformer, during the first few days after the spill, were airborne concentrations of PCB's found to exceed Ministry guidelines. PCB levels thereafter declined to normal concentrations. Inside the school, moderately elevated, but acceptable, PCB levels were recorded in air samples in the part of the building immediately adjacent to the transformer. At all other indoor locations, including classrooms, airborne PCB concentrations were well below the most stringent occupational health guideline in current use.

Soil was found to be contaminated to a lateral distance of approximately 5 m, and to a depth of 3 m from the transformer. The highest recorded PCB concentration in soil was 3400 g/g, fresh weight. Approximately 50 m^3 of contaminated soil was removed. The occurrence of virtually no PCB's in groundwater near the spill site or in sump water in the building indicated that no lateral movement of contamination had occurred at groundwater depth.

It is proposed that the 930 litres of water containing low PCB levels pumped from the excavation be taken to a local landfill site. Pending other arrangements, the 300 drums of contaminated asphalt and soil will be retained in temporary storage on Thunder Bay Hydro property.

Future actions include improved reporting procedures for both Thunder Bay Hydro and the Ministry, the development of local monitoring capability, and the need for ~~this~~ the acquisition of a permanent disposal site for hazardous wastes.

INTRODUCTION

On Thursday, October 8, 1980, at approximately 1535 h, a transformer located on the grounds of Isabella Street School, Thunder Bay, ruptured and discharged a quantity of insulating fluid to the near vicinity. The transformer, situated at ground level near the east wall of the building (Figure 1) contained approximately 400 litres of "askarel", the composition of which was 70 percent PCB (polychlorinated biphenyl) compounds and 30 percent TCB (trichlorobenzene).

The Ontario Ministry of the Environment was first contacted about the incident at 0800 h on October 9, when Mr. C. D. Biggs, Superintendent, Thunder Bay, telephoned the Ministry's Regional Director, Mr. R. M. Gotts, at his residence. This report describes the participation of the Industrial Abatement Section and the Technical Support Section, Ministry of the Environment, Northwestern Region, during the clean-up operations which followed.

ABATEMENT OPERATIONS

OCTOBER 9

Mr. V. L. Huggard, Senior Environmental Officer, arrived at Isabella Street School at approximately 0900 h and met with Mr. Biggs to evaluate the extent of the PCB spill and to advise him on the clean-up procedure. Thunder Bay Hydro had installed a snow fence around the perimeter of the contaminated area, but on further inspection, Mr. Huggard recommended the area be expanded to include a few small patches of suspected contamination that were observed outside the original area. It was determined that on the occurrence of the failure, Mr. W. Prochnicki, School Custodian, and Mr. H. Callaghan, Painter, had distributed sawdust over the pooled transformer oil to absorb the material and limit the extent of the contaminated area. At approximately 1030 h, October 9, Mr. Huggard visited Thunder Bay Hydro's field office

to visually inspect the ruptured transformer and to gather pertinent information concerning the volume and identity of the insulating fluid. The transformer had been positioned on a wooden pallet and was completely enclosed in heavy plastic sheeting to eliminate any further spillage of its contents. An estimated one-third of the "askarel" in the transformer had been discharged after the initial rupture. At approximately 1130 h, Mr. Huggard returned to Isabella Street School and met Mr. Biggs to further discuss the clean-up procedures, including the removal of contaminated asphalt in the vicinity of the transformer. Mr. Huggard also met Mr. House, School Principal, and Mr. Butuk, Director of Engineering, Thunder Bay Hydro, to discuss the removal of the material and the restriction of students and staff from the contaminated area. Mr. House indicated that five children had been in the immediate vicinity of the transformer at the time of the failure and that one of the children was sitting on the transformer when the rupture occurred.

At 1400 h, Mr. Huggard returned to the Regional Office to report his investigations to Mr. R. M. Gotts, Regional Director. Although equipment to monitor airborne PCB's was not immediately available, staff of the Ministry were satisfied that the spill from the transformer had been contained in a very small area, and that contamination inside the school would probably be minimal. However, as a precaution, arrangements were made with Air Resources Branch, Toronto, to immediately send a scientist and appropriate air sampling equipment to Thunder Bay. It was also determined that the school was heated by a hot water system and that the air from the electrical distribution room and adjacent boiler room, which could have been contaminated, was not being circulated to other parts of the school.

A meeting was arranged for 1500 h at Isabella School, to include the Principal, representatives of Thunder Bay Hydro, Ministry of Labour, and the Ministry of the Environment. Mr. Gotts then contacted Dr. S. Graham, Medical Officer of Health, Thunder Bay District Health Unit, to relay the information. Health effects and the possible contact of students and staff of the

school with the spilled transformer fluid were discussed. The staff and the students involved were contacted and requested to join the meeting. These individuals were each interviewed concerning their involvement with the spilled material. Children reported to be in the immediate area of the rupture were accompanied by their parents, who were informed of the potentially hazardous nature of PCB's and that arrangements would be made, as a precaution, to have directly contaminated clothing collected and destroyed. The school staff were interviewed by Mr. M. Kibzey, Industrial Safety Officer, Ministry of Labour, concerning the same matter. As a further precaution, an extra-curricular event scheduled for 1530 h in the gymnasium was re-located outdoors, on the side of the school opposite the transformer site. Because October 10 was a professional development day (no classes scheduled), and October 13 was a public holiday, Dr. Graham was not required to consider the need for closing the school until October 14. Ministry of the Environment began air quality monitoring in the area during the evening of October 9.

OCTOBER 10

Clean-up of the area by Thunder Bay Hydro continued. Mr. Gotts convened a meeting with representatives of the Lakehead Board of Education, Thunder Bay Hydro, Ministry of Labour, and Dr. S. Graham, the Medical Officer of Health. Clean-up procedures were reviewed and a formal news release, which indicated the responsibility of each agency and the clean-up procedures that were involved, was prepared and issued to the news media by the Lakehead Board of Education. The release also stated that parents had been advised of the nature of the material, the precautions that should be taken, and that they should contact their family doctor or the Ministry of Health for further information.

Because rain was forecast, the contaminated asphalt that was being removed was placed in a stockpile adjacent to the spill within the fenced-off area and the pile was wrapped with heavy

plastic sheeting to ensure that no leachate or runoff could further complicate the clean-up. Thunder Bay Hydro was directed to remove both the concrete pad, which supported the ruptured transformer, and the conduit leading into the electrical distribution room adjacent to the School's boiler room.

OCTOBER 11-12

Clean-up by Thunder Bay Hydro continued throughout the weekend. Monitoring by the Ministry was carried out by Dr. H. D. Griffin, Chief, Air Quality Assessment. Spotchecks by Industrial Abatement personnel were undertaken throughout the weekend to ensure that all contaminated material was collected and properly placed in drums for future disposal.

OCTOBER 13 (PUBLIC HOLIDAY)

A meeting of representatives of Ministry of the Environment, Lakehead Board of Education, Thunder Bay Hydro, Ministry of Labour and the Medical Officer of Health was held at the school. Clean-up procedures and the initial results from environmental monitoring were reviewed to decide whether the school would be re-opened on October 14. Dr. Graham, in consultation with Dr. M. Fitch, Director, Special Studies and Services Branch, Ministry of Labour, Toronto, decided that the concentration of PCB's in the environment of the classroom did not constitute a health hazard to the children and, therefore, recommended that school be opened the following day. The Ministry of Labour also agreed that PCB levels were safe for school staff, and approved normal resumption of school operations.

OCTOBER 14

W. M. Vrooman, Assistant Regional Director, Ministry of the Environment, met the school principal to again review clean-up procedures and air quality data. Due to the number of calls received from concerned parents and the need to present to them the complete story of the transformer failure and the ensuing

involvement by the various agencies, it was felt that a public meeting with parents of the school would be adviseable. Mr. House discussed the proposal with the President of the Home and School Association and made the necessary arrangements for a public meeting on the evening of October 15.

After the removal of the transformer's concrete support pad and the conduit to the electrical distribution room, a pocket of highly contaminated soil was found beneath the transformer which required further excavation by Thunder Bay Hydro.

OCTOBER 15

Clean-up and monitoring continued by Thunder Bay Hydro and the Ministry of the Environment, respectively. A public meeting was held with the parents of the school and the media at Fort William Collegiate at 2000 h. Representatives from Thunder Bay Hydro, Ministry of Labour, Lakehead Board of Education, Thunder Bay District Health Unit, and the Ministry of the Environment were present. Mr. K. House, Principal of Isabella Street School, chaired the meeting and asked a representative from each agency to speak to the parents. Dr. D. Harding of the Ministry of Labour, and Dr. S. Graham, Medical Officer of Health, described the effects of PCB's on human health, based on a number of research investigations. The main concerns of the public were the delay by Thunder Bay Hydro in reporting the incident to an appropriate government agency, the decision to have the school remain open the day after the transformer failure, and the possible health effects to the children during the clean-up operation.

OCTOBER 16

Further analysis of samples from the contaminated area indicated that additional soil had to be removed. In compliance with a Ministry recommendation, this work was carried out after school hours. A notice was sent by the Principal to the parents showing all the air quality monitoring results to date.

OCTOBER 18

The analysis of soil samples collected on October 16 indicated that one small area required additional excavation. Arrangements were made with Thunder Bay Hydro to have this work completed on October 19.

OCTOBER 19

Thunder Bay Hydro removed the contaminated soil and pumped out water which had accumulated in the excavation from seepage of groundwater and from rainwater run-off. The water was retained in five drums and samples were submitted for analysis.

OCTOBER 20

Results of soil analysis showed levels to be within acceptable limits. Arrangements were made with Thunder Bay Hydro to backfill the excavation with clean soil.

OCTOBER 21

Thunder Bay Hydro filled in the excavation and cleaned up all debris and equipment used during the incident.

OCTOBER 27-NOVEMBER 7

A replacement transformer, containing non-PCB insulating fluid, was installed at the school and the surrounding area was re-surfaced with asphalt.

MONITORING INVESTIGATIONS

AIR QUALITY MONITORING

Airborne PCB Levels

Atmospheric monitoring was undertaken with three gas samplers (model 221, manufactured by Nutech Corporation) equipped with glass cartridges packed with an absorbent compound ("fluorosil") at the inlet of the sampling line. The flow rate of air

through the cartridge was set at approximately 10 litres per minute, and the total air volume sampled was recorded by the instrument. Exposed cartridges were submitted to a private laboratory, where the PCB's in the "fluorosil" were extracted with pentane. At the Ministry's Air Resources Branch laboratory in Toronto, the extracts were analysed for PCB content with a gas chromatograph equipped with high-resolution dual capillary columns.

To obtain an adequate sample for analysis, the minimum sampling period was set at 1 hour. Most sampling periods were 8 or 24 hours, with the 8-hour exposures restricted to indoor locations. One monitor was permanently located 2-3 m from the transformer site, and the other two were operated at several locations in the school, and at a point in the playground area about 30 m from the transformer.

The air sampling results are summarized in Table 1. The outdoor data were interpreted in relation to current Ministry of the Environment guidelines for maximum acceptable PCB concentrations: 450 ng/m^3 (nanograms of PCB's per cubic metre of air) averaged over 30 minutes, or 150 ng/m^3 for a 24-hour sampling period. Because the minimum sampling period in the survey was 1 hour, a value of 400 ng/m^3 was unofficially adopted as the guideline for data for 1-hour air samples. Results for indoor monitoring were compared to a proposed TLV (threshold limit value) of 1000 ng/m^3 for occupational health. This concentration applies to an exposure of 8 hours per day, 40 hours per week, and is the most stringent existing or proposed TLV for PCB's in the workplace environment.

At the outdoor site near the transformer, PCB concentrations were initially very variable. During the first few days after the spill, the Ministry guidelines were exceeded on three occasions. Most of the PCB detected was thought to be in gaseous form, though some contaminated particulate matter (dust) may have been present in the air during clean-up operations. Highly contaminated asphalt was stockpiled under plastic sheeting near the monitor for 2 or 3 days after the spill, and vapours from this source may have contributed significantly to the PCB concen-

trations recorded. As the clean-up progressed, and the more heavily contaminated material was removed, PCB levels declined. By the time the excavation was filled in (October 21), concentrations close to normal background had been reached. Two samples, collected from October 16 to October 18 in the playground area, showed that PCB concentrations declined sharply within a short distance (30 m) from the spill site. The results for the playground suggest that Ministry guidelines were not exceeded at any time outside the immediate vicinity of the spill. The only individuals exposed to significantly elevated concentrations would have been those involved in the clean-up operation. However, because only one reading above the proposed TLV of 1000 ng/m^3 was recorded, and because clean-up activities were completed in less than 2 weeks, there was no indication that anyone was exposed to hazardous PCB levels.

Inside the school, highest PCB concentrations were monitored in the boiler room area, at the point where the conduit containing cables from the transformer to the electrical distribution panel entered the school. The highest level recorded, 450 ng/m^3, was still well below the maximum acceptable TLV of 1000 ng/m^3. PCB concentrations were generally in the 200-300 ng/m^3 range at this location until after the conduit was removed (October 12) and the hole at its entry point sealed (October 13). Final concentrations stabilized at approximately the 50-100 ng/m^3 level. In the classroom closest to the transformer (Room 2), PCB levels ranged from 28 to 154 ng/m^3. There was no evidence that significant quantities of airborne PCB's had entered this room from the spill area. There was a modest increase in PCB concentrations, for no obvious reason, from October 13-16, then a decline to a stable level in the 20-60 ng/m^3 range. At worst, PCB concentrations in Room 2 never exceeded 15 percent of the TLV. In other classrooms and in the gymnasium, all PCB levels were between 50 and 90 ng/m^3. Although normal background PCB concentrations in Isabella Street School are unknown, levels much below 30 ng/m^3 might not be expected. PCB sources such as leaking ballasts in fluoroscent light units or caulking compounds

employed in construction of the school could both potentially contribute to PCB levels somewhat higher than those anticipated outdoors. A brief survey conducted in 1979 at two outdoor sites in Thunder Bay recorded average PCB concentrations of approximately 5 ng/m^3.

SWAB TESTS

To determine whether airborne PCB's had adhered in significant quantity to indoor surfaces at Isabella Street School, pieces of hexane-soaked cotton wool were swabbed over selected areas in the boiler room and in Classroom 2. The swabs on October 14 were taken from an undetermined surface area. Those for October 19 were restricted to 400 cm^2 (square centimetres) per sample. The results of these tests, reported in Table 2, provide evidence that PCB's were deposited on surfaces within 2-3 m of the conduit entry point. A high PCB concentration, probably from lubricant oil, was found on the surface of the air compressor in the boiler room. Virtually no PCB material was detected on the walls of Classroom 2 or in the adjacent hallway. The swab tests were performed only to determine presence or absence of PCB's. The results cannot be directly compared to the air quality monitoring data.

SOIL SAMPLING

After the ruptured transformer was removed (evening of October 8), asphalt known or suspected of being contaminated was dug up. On October 10, the first soil samples beneath the asphalt were collected. These samples were obtained with a stainless steel corer inserted into the ground to a depth of 30 cm (centimetres) at sites 1, 2, and 3 (see Figure 2). Several cores were obtained from each site and divided into surface (0-15 cm) and subsurface (15-30 cm) portions. Sample material was submitted to the Ministry's central laboratory in Toronto for analysis. From each sample, a 10 g (gram) portion was segregated and weighed,

then treated with acetone to extract the PCB's. The extract was filtered, made up to a known volume, evaporated to near dryness, diluted with hexane, then finally injected into a gas chromatograph equipped with an electron capture detector. The resulting profile plotted on the recorder was compared to known PCB standards.

The results of the soil sampling programme are summarized in Table 3. Because the data were required quickly to guide soil excavation operations, the concentrations were determined on an as-received basis to avoid the normal, but time-consuming procedure of drying the samples before analysis. Expressed in relation to dry weight, the concentrations of PCB's in the samples at locations in the upper levels of the excavations (sites 1-14) should be increased by approximately 10-15 percent, but the values reported for the very wet samples at the bottom of the excavation (site 15) should be at least doubled to obtain dry-weight concentrations.

The samples from October 10 showed that there was significant contamination in surface soil near the transformer. After approximately 0.6 m of soil was removed within 3 m of the transformer, and 0.3 m excavated from the rest of the main excavation area and the isolated outer patches, the whole area was resampled on October 12. This second set of samples showed that the isolated outer pockets were free of contamination but that significantly elevated PCB was still present within 5 m of the transformer. The excavation was deepened to approximately 1.5-2 m within 2-3 m of the transformer, and to 0.5-0.7 m in the area at a lateral distance of 3-8 m from the transformer. Under the transformer site itself, a pocket of darkly-stained soil, with a strong "askarel" odour, was encountered at a depth of 2-2.5 m. The occurrence of this area of highly contaminated soil (3400 µg/g), was completely unexpected. Transformer fluid leakages in past years may have caused this contamination, but there are no historical records to support or deny this assumption. Several sessions of careful manual digging, interspersed with sampling on October 16

and 19, were required to remove this soil. The final depth of excavation was approximately 3 m, which was about 0.5 to 1.0 m below the water table. The last set of soil samples showed that PCB concentrations did not exceed 5 µg/g. The base of the walls of the excavation contained < 1 µg/g PCB's. To replace the 300-odd drums of contaminated material removed, approximately 50 m^3 of clean fill was dumped in the hole on October 21.

GROUNDWATER SAMPLING

To resolve concerns about possible contamination of groundwater in the area surrounding the spill site, four test boreholes were drilled at locations approximately 10 m from the transformer (Figure 1). These holes extended a short distance below the surface of the water table. Samples of wet soil from this depth (2-2.5 m) in each hole were tested by the Ministry's Toronto laboratory and found to contain virtually no PCB's. This finding indicates that there was no lateral movement of PCB's from the spill site. Because the general area is very flat and the soil at water table depth is of low permeability, the lateral movement of groundwater was not expected to move at a rate exceeding a few metres per year. As a final assurance that no groundwater contamination had occurred, water draining into the boiler room sump from the tile beds along the footings of the building was also sampled. Since this water contained less than 1 µg/l (microgram of PCB's per litre of water), there was no evidence that any PCB compounds had moved from the contaminated site to the drainage area around the base of the school.

DISPOSAL OF CONTAMINATED MATERIALS

Due to the urgency of clean-up, Thunder Bay Hydro obtained used, steel drums from several local sources to temporarily store contaminated asphalt and soil from the transformer area. Fol-

lowing the incident, drums approved for hazardous waste disposal were purchased. The soil was then transferred to the new drums at Hydro's warehouse on Front Street. Thunder Bay Hydro was instructed by the Ministry to store the drums in their warehouse until proper disposal facilities were approved. Attempts to arrange permanent disposal will be made by Thunder Bay Hydro, with the assistance of the Ministry of the Environment. The Ministry of the Environment recommended that the original drums used for temporary storage be cleaned, crushed, and sent to an approved landfill site, or used for metal recycling.

The water which collected at the bottom of the final excavation contained 75 µg/l of PCB's. Since this level is equivalent to a total weight of only 0.1 grams (0.0002 pounds), the Ministry will ask the City of Thunder Bay for approval to dispose of the water at the John Street landfill site.

Although parents of all students were requested to turn in contaminated clothing to the school principal, to date only one pair of shoes has been included with the custodian's and painter's clothing for permanent disposal.

MEDICAL EXAMINATIONS

At the public meeting on October 15, Dr. Graham, the Medical Officer of Health, offered to arrange medical testing at McKellar General Hospital for children who had been near the transformer when it ruptured. Two children have been examined to date, but the results are not yet available.

FUTURE ACTION

1. A letter will be sent to Thunder Bay Hydro, pointing out that Thunder Bay Hydro should have immediately reported the PCB spill to the Ministry of the Environment, as specified in Sections 13 and 15 of The Environmental Protection Act, 1971. No further action is recommended.

2. The capability of Ministry Regional Offices to undertake contingency and non-routine air quality monitoring will be significantly improved. All Regions are shortly expecting delivery of emergency response vehicles which will be equipped to deal with spills and other environmental contingencies. Appropriate monitoring equipment will be included in these vehicles.

   Because of the substantial cost, required expertise, and very limited anticipated need, we will not, at the present time, develop the capability at the Regional level for analysis of samples for exotic contaminants. For example, for PCB air samples, the Ministry presently contracts the tasks of "fluorosil" cartridge preparation and extraction of PCB's from exposed cartridges to a private laboratory, at a current approximate cost of $150 per sample. The cost of the actual analysis, which is undertaken in a Ministry laboratory, would be an additional expenditure.

3. All staff involved in contingency situations will be made aware of the need to immediately contact the appropriate local public health agency when potential health effects from hazardous contaminants must be considered. This action should be taken if there is any doubt as to whether a potential health hazard exists.

4. Because Thunder Bay Hydro now has several hundred drums of contaminated waste to be added to a growing provincial quantity of undisposed hazardous contaminants, efforts should be intensified to secure a permanent disposal site for materials of this nature.

ACKNOWLEDGEMENTS

The cooperation and assistance of the following individuals and groups is gratefully acknowledged: J. Osborne, Pesticides Section, Laboratory Services Branch for soil and water analysis;

R. Bell and other members of the Monitoring and Instrumentation Development Unit, Air Resources Branch, for establishing the air quality monitoring programme and for performing the analysis of air quality samples; and W. Prochnicki, Chief Custodian, Isabella Street School, for assisting with arrangements for many aspects of the air quality monitoring programme.

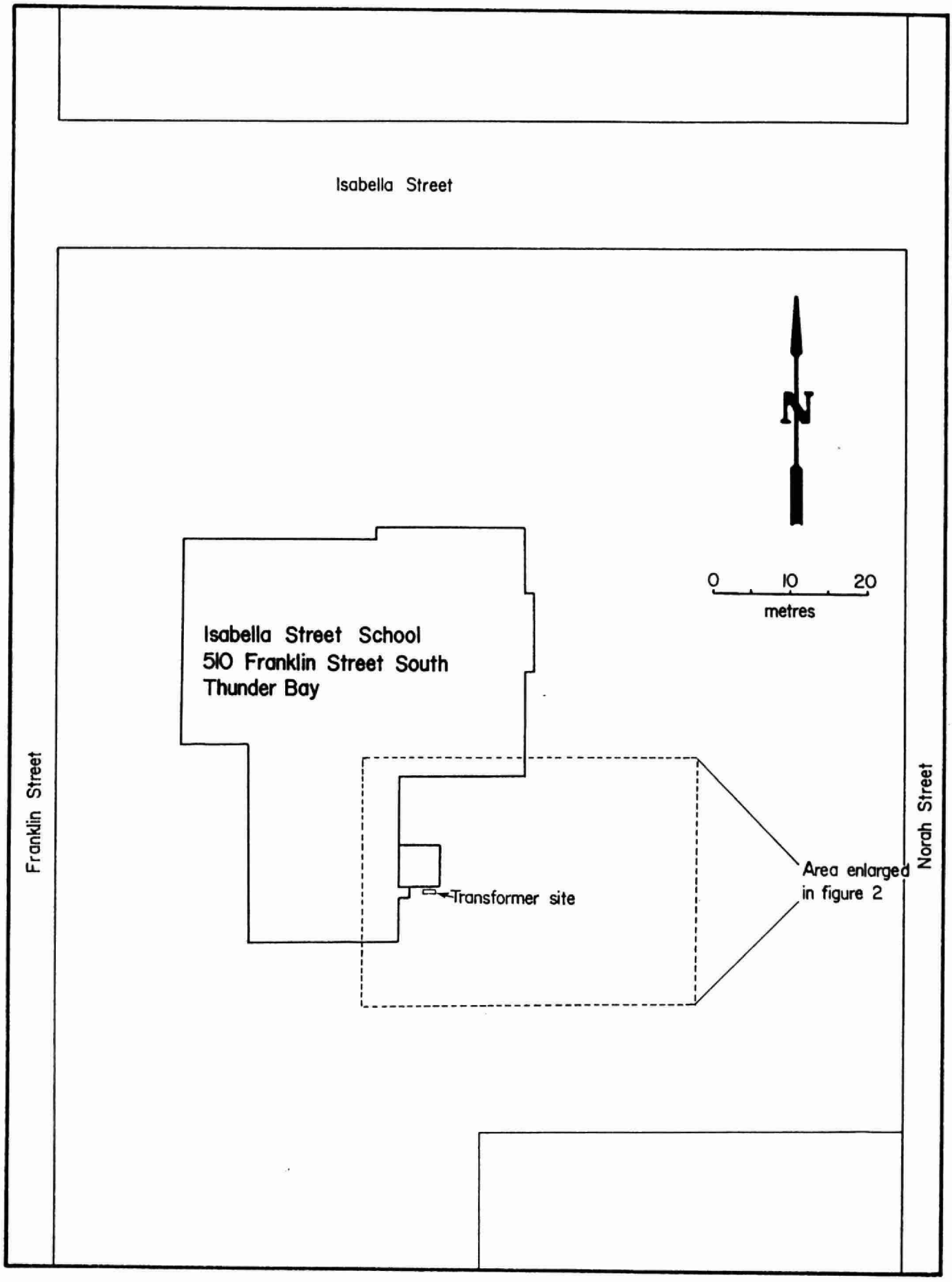

Figure 1. Isabella School grounds, Thunder Bay.

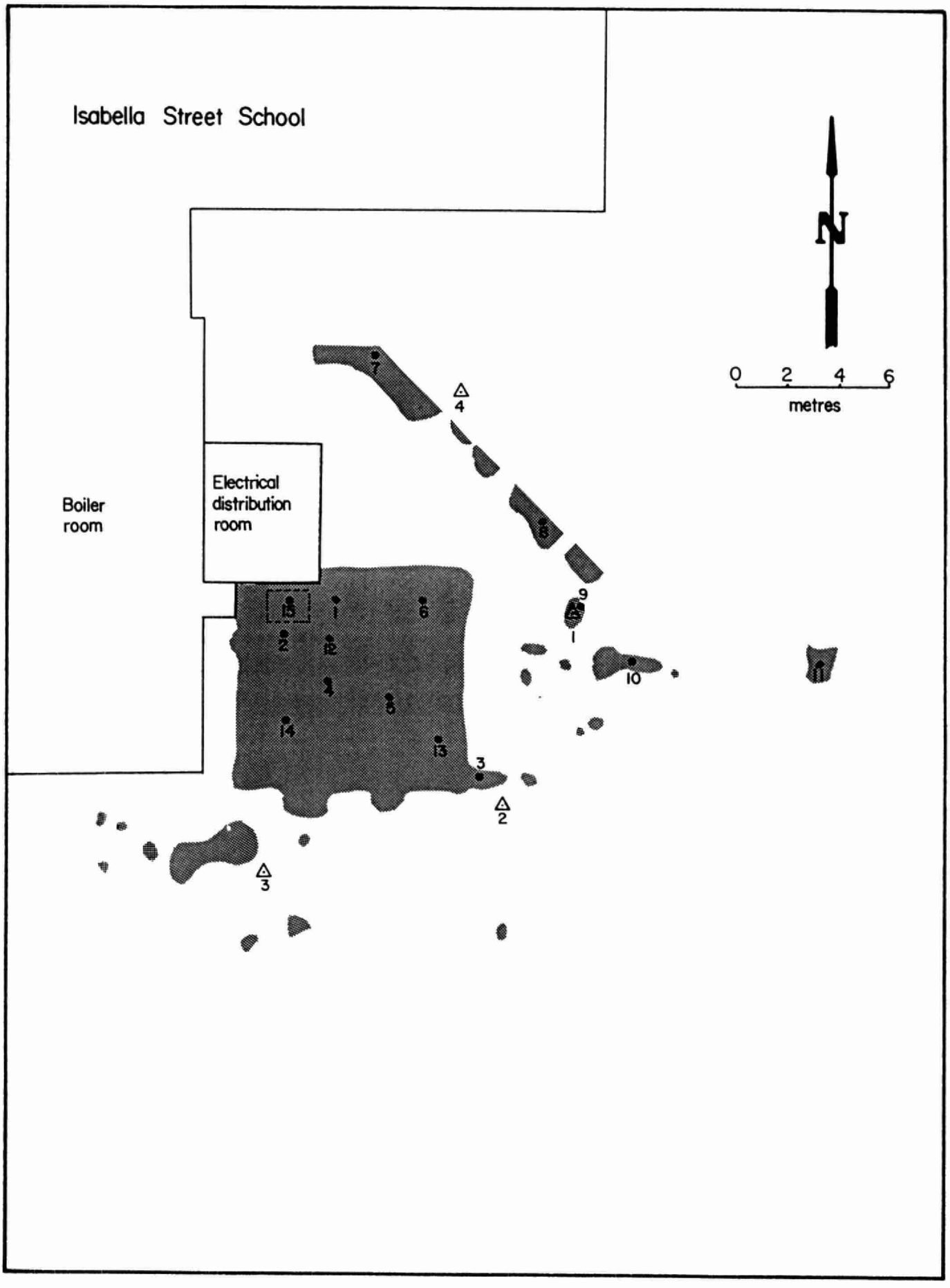

Figure 2. Excavation areas in vicinity of ruptured transformer, Isabella Street School.

Test drill holes △ Soil sampling sites •

TABLE 1. Airborne PCB concentrations (ng/m^3)[a], Isabella Street School, Thunder Bay.

Date	Time	Sampling period (hours)	Outdoors[b]		Indoors					
					Boiler	Classrooms				
			T	P	room area	2	6	10	12	Gym
October 9	2100-2200	1	103		250	90				
	2230-2330	1	60		260	87				
10	0000-0800	8	280		245	57				
	1200-2000	8	1800		450	60				
10-11	2100-2100	24	133		180	70				
11-12	1800-1800	24	700					50		80
13	0000-0800	8	700		250	95				
	0900-1000	1	760		180	96				
	2200-2300	1	93		292	127				
13-14	2300-0700	8	70		214		67			
14-15	0730-0730	24	60		50					90
15	1530-2330	8				154				
15-16	0800-0800	24	86		91					
16	1530-2330	8				102				

TABLE 1. Continued.

Date	Time	Sampling period (hours)	Outdoors[b]		Indoors					
					Boiler room area	Classrooms				Gym
			T	P		2	6	10	12	
October 16-17	0800-0800	24	41	2						
17	0830-1630	8				58				
17-18	0830-0830	24	82	5						
18	0930-1730	8			117		62			
18-19	0845-0845	24	34							
19	0830-1730	9				42			56	
19-20	0845-0845	24	46							
20	1545-2345	8				24		12		
20-21	0845-0845	24	75							
21	1530-2330	8				51				
21-22	0830-0830	24	28							
22	0845-1645	8			107					
22-23	0830-0830	24	11							

[a] acceptable levels: Outdoors: 400 ng/m^3 (1-hour average), 150 ng/m^3 (24-hour average)
Indoors: 1000 ng/m^3 (8-hour average, 40 hours per week)

[b] T = transformer site; P = playground (30 metres ENE of transformer)

TABLE 2. Swab tests for PCB's, Isabella Street School.

Date	Location	Distance (metres) from source[a]	PCB concentration (ng/ml)[b]
October 14 (Boiler room area)	Concrete wall near conduit entry point	0	1300
	Electrical distribution panel near conduit entry point	1	150
	Cover of fluorescent light fixture on ceiling	2.5	50
	Fuse boxes in boiler room	10	4
	Surface of air compressor, boiler room	8	3200
	Blank	-	20
October 19 (Room 2)	Wall between windows	4	6
	Wall at northwest corner	10	3
	West wall, near hall door	8	4
	West wall of hallway, opposite Room 2	12	6
	Blank	-	6

[a]For the boiler room area, the source is designated as the point where the conduit from the transformer entered the building. For Room 2, the source is the transformer site.

[b]nanograms of PCB compounds per millilitre of extract.

TABLE 3. Concentrations of PCB's (μg/g, fresh weight) in soil sampled in the vicinity of the ruptured transformer at Isabella Street School, Thunder Bay.

Sampling site (see Figure 2)	Distance (metres) and direction from transformer	Sampling date (October, 1980) 10[a]	12	14	16	19
1	2 m E	1600	1700	10		
		19				
2	2 m S	860	180	24		
		51				
3	10 m SE	2				
		<1				
4	4 m SSE		250			
5	5 m SE		100	<1		
6	5 m E		300	<1		
7	10 m NNE		<1			
8	10 m NE		<1			
9	10 m E		<1			
10	13 m E		<1			
11	21 m E		<1			
12	3 m SE			<1		
13	8 m SE			17		
14	5 m S			<1		
15	nil			3400	72[b]	5[c]

[a] first value cited for each location on October 10 represents 0-15 cm depth, and second value represents 15-30 cm; values for other dates represent 0-15 cm depth

[b] composite of three samples of 5-10 cores each

[c] composite of sections of 5-10 cores, 15-20 cm below floor of excavation

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